Integrating hunter knowledge with community-based conservation in the Pamir Region of Tajikistan

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Abstract: Indigenous hunting communities around the world possess capabilities to accumulate and maintain knowledge based on their traditional practices, cultural norms, and belief systems. Case studies around the world have demonstrated that merging indigenous hunting knowledge with community-based conservation approaches is often complementary to biodiversity conservation. A combination of such approaches improves wildlife conservation practices and livelihood strategies while enhancing communities' social-ecological resilience. However, if mismanaged, such approaches lead to negative results in the community, such as an increased exposure/vulnerability to corruption, power inequality among interest groups, as well as mismanagement of wildlife species. We explore the existence of hunting-specific traditional ecological knowledge and the contribution of such knowledge to wildlife management in the case of community-based conservation in Tajikistan. We reviewed hunting-related literature from 1850 to 1950, conducted interviews, and accompanied hunters in the field to document their ecological knowledge of the Gorno-Badakhshan Autonomous Oblast (GBAO), also known as the Pamir region of Tajikistan. Throughout our research, we found that there exists a rich body of hunter-specific ecological knowledge of hunting norms, ethics, taboos, and belief systems in the Pamir region of Tajikistan. Traditional hunters largely accepted a community-based conservation approach because it resonates with their subsistence hunting practices. Also, combining traditional hunter knowledge with a community-based conservation approach created an opportunity for knowledge sharing, improved the quality of scientific wildlife surveys, and led to better collaboration among conservancies and other conservation NGOs. More importantly, such approaches empowered and incentivized local traditional hunters to take responsibility for wildlife management.

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Research

Integrating hunter knowledge with community-based conservation in the Pamir Region of Tajikistan

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ABSTRACT. Indigenous hunting communities around the world possess capabilities to accumulate and maintain knowledge based on their traditional practices, cultural norms, and belief systems. Case studies around the world have demonstrated that merging indigenous hunting knowledge with community-based conservation approaches is often complementary to biodiversity conservation. A combination of such approaches improves wildlife conservation practices and livelihood strategies while enhancing communities' social-ecological resilience. However, if mismanaged, such approaches lead to negative results in the community, such as an increased exposure/vulnerability to corruption, power inequality among interest groups, as well as mismanagement of wildlife species. We explore the existence of hunting-specific traditional ecological knowledge and the contribution of such knowledge to wildlife management in the case of community-based conservation in Tajikistan. We reviewed hunting-related literature from 1850 to 1950, conducted interviews, and accompanied hunters in the field to document their ecological knowledge of the Gorno-Badakhshan Autonomous Oblast (GBAO), also known as the Pamir region of Tajikistan. Throughout our research, we found that there exists a rich body of hunter-specific ecological knowledge of hunting norms, ethics, taboos, and belief systems in the Pamir region of Tajikistan. Traditional hunters largely accepted a community-based conservation approach because it resonates with their subsistence hunting practices. Also, combining traditional hunter knowledge with a community-based conservation approach created an opportunity for knowledge sharing, improved the quality of scientific wildlife surveys, and led to better collaboration among conservancies and other conservation NGOs. More importantly, such approaches empowered and incentivized local traditional hunters to take responsibility for wildlife management.

Key Words: *community-based conservation; hunting; natural resource management; Pamir Mountains; resilience; social-ecological change; Tajikistan; traditional ecological knowledge*

INTRODUCTION

Several studies have integrated traditional ecological knowledge systems into various management systems, i.e., community-based conservation (Xu et al. 2005, Houde 2007, Butler et al. 2012, McPherson et al. 2016). Community-based conservation provides an important way of protecting wildlife and its habitat, particularly in developing countries (Fernández-Giménez et al. 2015, Campos-Silva et al. 2017). A variety of community-based approaches around the world utilize and rely on traditional ecological knowledge (Berkes 2006, Butler et al. 2012, Ruiz-Mallén and Corbera 2013). Traditional societies accumulate and maintain knowledge of the natural environment based on experience, cultural norms, and belief systems (Berkes 2012). This knowledge is passed down from one generation to another, usually orally and by apprenticeship. In this paper, we define traditional ecological knowledge (TEK) as "a cumulative body of knowledge and beliefs, handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment" (Berkes 2012:7).

Community-based natural resource management programs emerged in the 1980s and granted communities the power to manage their natural resources independently (Berkes 2007). Community-based conservation projects are often self-regulated (Ruiz-Mallén and Corbera 2013) or comanaged by the community together with government institutions and other stakeholders (Berkes 2009). Becker and Ghimire (2003) argue that synergies between TEK and scientific knowledge can contribute to biodiversity conservation because they complement each other and both rely on observation, experience, experimentation, and interpretation. Similarly, Berkes (2004) suggested that linking conservationists with indigenous groups and local institutions can lead to better conservation results: indigenous people are more likely to approve of conservation measures that they participate in developing than regulations that are imposed by government agencies.

Scholars have argued that numerous community-based conservation approaches empower communities by respecting their ownership of the management of resources that are protected through conservation schemes (Ruiz-Mallén et al. 2015). Community-based conservation is defined as "to enhance wildlife/biodiversity conservation and to provide incentives, normally economic, for local people" (Campbell and Vainio-Mattila 2003:421). Community-based conservation initiatives often integrate TEK, rules, and regulations into formal institutions and thus enhance communities' adaptive capacities to new social-ecological changes (Ruiz-Mallén and Corbera 2013). For example, linking Inuit regional institutions with government agencies has enabled individual communities to participate and have joint decision-making power, i.e., of wildlife and fish management. Such institutional arrangements help communities to self-organize and build communities' adaptive capacity to respond to new changes (Berkes and Jolly 2001).

If a community-based conservation approach is implemented well, it can support communities with incentive-based conservation policies (Ruiz-Mallén et al. 2015). It can better integrate outside expert knowledge, encouraging the use of shared resources and problem solving (Ulambayar et al. 2017). However, if not managed well, community-based conservation can

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undermine ecological knowledge of local communities (Goldman 2003), increase corruption (Brockington 2004), or allow control of resources by people whose values and interests may not align with the community and traditional culture (Kamoto et al. 2013).

Van Viet et al. (2015) argue that hunting systems are complex social-ecological systems because of the complexity of dynamic relationships among ecological components (i.e., prey, territory, and resources), social components (i.e., hunters, families, and other institutions), and drivers of change (i.e., demographics, governance, etc.). Many remote and rural communities still depend on hunting for subsistence (Brinkman et al. 2014, Read et al. 2010), and more importantly, they rely on their TEK to be able to understand wildlife ecology (Peloquin and Berkes 2009, Gómez-Baggethun and Reyes-García 2013). However, not all indigenous communities have retained (all of) their traditional practices. For instance, North American Indians have transitioned into a mixed economy in which hunting is still conducted but not on a full-time basis (Reo and Whyte 2012). Some subsistence communities have adopted approaches of comanagement (Berkes 2009) while others engage in self-managed community-based initiatives (Ruiz-Mallén and Corbera 2013). In our study, we use the concept of social-ecological resilience within the context of community-based conservation approaches to understand hunting dynamics in the Pamir region of Tajikistan.

Four community-based conservation projects will be referred to as "conservancies." In the context of Tajikistan, we consider only conservancies large enough to host at least a few hundred Marco Polo sheep *Ovis Ammon Polii* and ibex *Capra sibirica* where "rights to manage wildlife [are] assigned to an organization based in the local community" (Michel and Rosen 2016:239).

REGIONAL CONTEXT

Residents of the Pamir region of Tajikistan have always depended on natural resources to sustain their livelihoods because of the region's rugged mountains and geographic remoteness (Huntington and Cushing 1922). The Pamir region has never been food-secure because of scarcity of land and a short growing season (Sherbut et al. 2015). The integration into the Soviet Union in 1924 led to mechanization in farming (Herbers 2001) and the resettlement of mountain communities to lower farmlands (Kassymbekova 2011). Since the 1960s, more and more wildlife habitats have been turned into farms (Pryde 1991) across all Central Asian republics. After the fall of the Soviet Union in 1990s, a civil war from 1992 to 1997 followed the country's independence (Horsman 1999). Residents of the Pamir region suffered because of their limited access to resources from the lowland.

Illegal hunting was common during the Soviet era because of a lack of enforcement and management of hunting laws (Govrilyuk and Yaroshenko 1987). After independence, the civil war intensified existing poverty (Breu et al. 2003, Michel et al. 2015). To obtain meat during this time, hunts conducted by inhabitants, soldiers, and border guards exacerbated the decline in wildlife numbers in the Pamir region (Fedosenko and Blank 2005). Since then, legal hunting has re-emerged as a crucial livelihood activity along with subsistence farming and nomadic herding. However, Soviet policies of resettlement in 1929, measures to regulate hunting practices in 1959, and the USSR law on the utilization and protection of the animal world in 1980 had negative effects on hunting knowledge and practices. Already in 1934, an ethnographer wrote that skills and knowledge of old hunting practices were rapidly disappearing in the face of industrialization and development (Kisliyakov 1934).

As the country recovered from the political turmoil of the 1990s and the difficult economic transition following independence from the Soviet Union, threatened-species experts, government agencies, scientific institutions, traditional hunters, and conservation activists joined together to create conservancy areas in 2008 (Michel 2008). Parcham, the first conservancy, was created in 2008 in the villages of Ravmed and Khidjez. The Burgut conservancy in Alichur village, the Yuz Palang conservancy in the village of Zong, and the Yoquti Darshai conservancy in the village of Darshai soon followed. Altogether conservancies in Tajikistan occupy roughly 300,000 hectares (Michel and Karimov 2017).

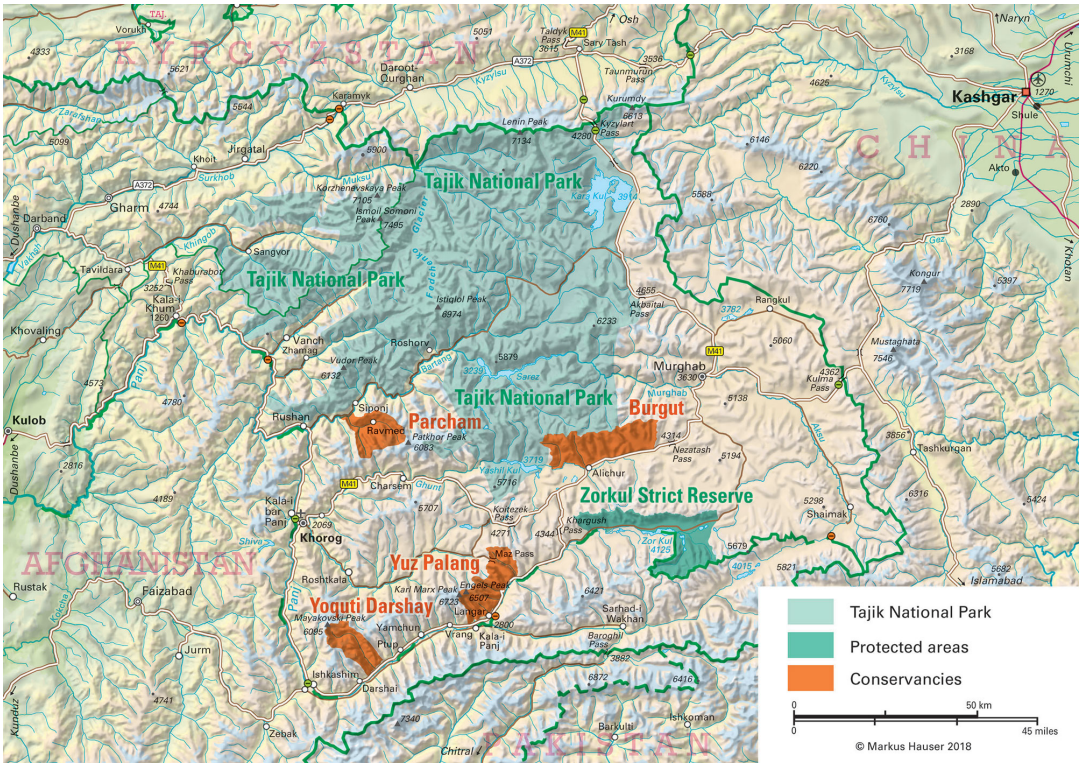
To build stronger partnerships, all conservancies are united under the umbrella of the Hunting and Conservation Alliance of Tajikistan (H&CAT). In 2015, H&CAT was recognized by the international NGOs and became a member of the International Council for Game and Wildlife Management and the International Union for the Conservation of Nature. Now, H&CAT acts on behalf of all community-based conservancies to foster local management. The creation of H&CAT led to much confusion among the hunting communities in Tajikistan because such an establishment was interpreted as a direct competitor to the traditionally established Hunting Association of Tajikistan. Because of external pressure and internal discussion among member conservancies, H&CAT changed its name in January of 2019 and now it is called the Association of Nature Conservation Organizations of Tajikistan (ANCOT).

Conservancies are governed by community-based natural resource management approaches that involve both traditional hunters and scientific experts. Experts from both western/scientific and traditional knowledge approaches conduct yearly surveys of mountain ungulates, regulate conservation and hunting, and organize wildlife watching tours (Michel and Karimov 2017). Traditional hunters manage different conservancies with the support of other stakeholders such as research institutions and wildlife protection groups from abroad. We summarize the key wildlife-management-related policies and overall political changes described above in Appendix 1.

Post-Soviet socioeconomic changes in the Pamir region of Tajikistan

As of today, the Pamir region faces a high level of poverty and unemployment. The economy is primarily dependent on remittances (AKDN 2015). Both the Western and Eastern Pamirs are identified as food-insecure regions with the level of recurrence above the 20% threshold (WFP 2017). Unemployment among youth remains high at 37% among men and 30% among women between the ages of 18 and 29 (AKDN 2015). The M41 Pamir highway is the only road that provides access to different parts of the Pamir region (Kreutzmann 2015), and access becomes challenging in winter months because of the rugged mountainous nature of the region. In order to seek employment, many men and women choose to migrate to Russia (Zotova and Cohen 2016). In 2017, remittances amounted to around US$2.2 billion, which makes up 30.7% of Tajikistan's GDP (World Bank 2018).

Fig. 1. Map of the conservancies and protected areas in the Pamir region of Tajikistan.



In the last decade, the government of Tajikistan has increasingly emphasized mountain tourism as a part of a development strategy to diversify community livelihood activities. Many international NGOs have also tried to implement tourism development projects; however, tourism development still faces challenges because of a lack of continued capacity building, qualified tourism personnel, and infrastructure (Shokirov et al. 2014). Seasonal hunting tourism provides more substantial income per client in conservancies and has diversified livelihood activities of communities (Michel and Rosen 2016). Alternatively, mountain tourism, e.g., guided tours and wildlife watching would generate less substantial income per client but can be steady throughout the year. Conservancies that hosted only hunters in the past have started to accommodate nature-based tourism by offering wildlife-watching and trekking tours.

METHODOLOGY

Data collection and analysis

This study was conducted in the Pamir mountain region of Tajikistan in the villages of Sumchin, Yamchun, Vrang, Langar, Ravmed, Khorog, Jelondi, Alichur, Murgab, and Karakul between 2015 and 2017. Four villages (Darshai, Langar, Alichur, and Ravmed) were chosen because those are the villages with conservancies. The rest of the villages were referred to us by different sources as the location of current hunters or where families of hunters reside.

Throughout this study, we sought to understand the ways in which traditional hunting practices and knowledge contribute to community-based conservation and how such processes might improve social-ecological resilience in those communities. We combined archival research, ethnography, and qualitative interviews to comprehensively document the existence and current use of traditional ecological knowledge by hunters in the Pamir region of Tajikistan.

Historical literature review

We conducted a historical literature review in two different archives: the archive of the University of Central Asia (located at the Agha Khan Development Network office in Geneva, Switzerland) and the archive of the Academy of Sciences of Tajikistan (in Dushanbe, Tajikistan). We identified and reviewed historical books and documents, i.e., summaries of expeditions specific to the Pamir Region of Tajikistan. Some of the reviewed books were published in Russian, but the majority of this body of literature has been published in English. Our review covered the time period between 1850 and 1950. Both archives do not have comprehensive electronic archiving systems. For that reason, we could not carry out keyword searches. The Academy of Sciences of Tajikistan has a Soviet hard-copy card catalog system for hunting. The archive of the Agha Khan Development Network has a list of books. Eventually, we reviewed all 57 books that contained any of the following words in the title: “Pamirs,” “Tajikistan,” “Central Asia,” “Turkestan,” “hunting,” “sports,” “adventure,” and “wildlife.”

Interviews

We conducted three field visits to the Eastern and Western Pamirs during this research project. The conservancies, villages, and the different protected areas where the fieldwork was based are mapped in Figure 1. The primary objective of the first visit in

Table 1. Definition of the interviewed groups.

Interviewees	Explanation of the groups
Conservancy rangers	Ranger who manages conservancy. Some of these rangers are also active hunters.
Protected area rangers	Employees of the national parks and protected areas run and managed by the state.
Rangers of private hunting concessions	Employees of the private hunting concessions.
Present-day hunters	Hunters actively hunting at the time of the interviews.
Retired hunters	Elderly hunters who have hunting knowledge and practice but no longer hunt.

2015 was to cultivate trust with rural people. The Eastern and Western Pamirs differ regarding geographic specificities, the ethnic composition of inhabitants, and livelihood practices. The Eastern Pamirs are a high plateau region; the inhabitants are mostly ethnic Kyrgyz who are engaged in nomadic pastoralism. They speak primarily Kyrgyz and Russian. The Western Pamir region's inhabitants are agro-pastoralists who engage in small-scale agriculture and keep livestock, which typically involves transhumant movements between summer and winter pastures. They speak different Pamiri languages (Yazgulomi, Shugni, Ishkashimi, and Wakhi) as well as Tajik and Russian.

The interviews were held in Tajik and Russian. All of our interviewees were male because only men were hunting and working as rangers. The interviewees included conservancy rangers (11), protected area rangers (5), private hunting concessions rangers (4), present-day hunters (11), and retired hunters (10; see Table 1 for a profile of interviewees). Conservancy rangers are most often former hunters who work for conservancies alongside other careers, i.e., as schoolteachers or mechanics. They have varied backgrounds and interests in addition to wildlife and hunting. Our interviews benefitted greatly from these different perspectives.

In this study, qualitative interviews provided important context needed to adequately describe the structure and function of human-environment interactions. Qualitative interviews were used for a number of reasons. First, a theoretical sampling of different stakeholder interviews, e.g., hunters, conservancy rangers, or park rangers, helped us to obtain (potentially) differing opinions. Second, qualitative interviews allowed for greater flexibility and in-depth questioning and thus enabled new relevant topics to emerge. Third, standardized questionnaires could have impeded responses about hunting, especially illegal hunting. This is also the reason why we avoided the use of a recording device. When we initially tried to record conversations, people said they did not mind it, but we noticed that they were less talkative and candid than when talking without a recording device, or even if the interviewer took written notes. (This was especially true if the interviewee was talking about illegal hunting or poaching, *brakonierstvo*, suggesting that these are sensitive topics). We thus decided to write down notes only after the interview was completed.

In villages, it was difficult to carry out formal interviews because most people were busy working in the fields during the times we were there. Some of the meetings/conversations took place while the interviewees were working, i.e., picking apricots, building new animal shelters, etc., or having tea. If interviewees were working, we participated in their activities to provide some help where possible. Such participant observation gave us a better understanding of people's livelihoods. During our interviews, for instance, we discussed specific topics related to TEK, i.e., hunting ethics and hunters' knowledge specifically about wildlife abundance, migratory patterns, location, and habitats. We further discussed how such knowledge is helping hunters in their conservancies, for instance for monitoring annual wildlife and conducting surveys.

When starting with our research project, we did not anticipate that we would be dealing with TEK, which is not widely documented in the post-Soviet space (Crate 2006). During our first round of interviews and observations, we asked questions related to hunting and community-based conservation. The majority of our interviews responded by saying that if you are interested in hunting "you should study and explore the real hunter, meaning hunters of the past," on which we will elaborate more below. This was a topic that all of our interviewees wanted to discuss. We received contacts of people who knew about families of hunters from other villages. Because hunting is a challenging job, the majority of the villages have only had one or two hunters, and therefore it was easy to identify such people. Moreover, conservancy rangers knew a lot about such hunters and their experiences. Talking about hunters of the past and listening to what our interviewees wanted to discuss created a stronger bond, which helped build trust. By the second and third rounds of our visits, our respondents started sharing their hunting stories, including but not limited to illegal game hunting, poaching, distinguishing between ethical and unethical hunters, corruption, and lobbying among hunting groups.

We anonymized sensitive information in this paper to protect our interview partners. Many of these interviewees indicated they were sharing sensitive information knowingly with us, and we assured them that we would not be jeopardizing their safety. Because the stories we were told were consistent (even regarding sensitive issues), and also because traditional hunting and related issues were brought up by our respondents, we are confident that we have reliable information, and were not just told what people thought we wanted to hear.

Selection of interviewees

During our initial visits to the conservancies, we met all of the rangers from each conservancy and talked about their work and livelihood activities. We interviewed rangers not only about their hunting knowledge and conservation, but also about other livelihood activities like agriculture and keeping livestock. This way, we could understand a broader perspective and draw conclusions on the importance of their conservation work in relation to other activities. We stayed in each conservancy for up to a week. Based on the group discussions, some of the rangers showed more enthusiasm and interest in our research than others or were more knowledgeable about the topics than others. Based on our first assessment, we then chose individuals, e.g., traditional

hunters and rangers with traditional hunting knowledge, for follow-up interviews.

Participant observation
Four times during our fieldwork, we were able to accompany rangers on hunting trips. On these trips, the hunters showed us how they hunt, including how they track, spot, and stalk animals. These hunts provided us with the opportunity to better understand the habits and habitats of ibex, Marco Polo sheep, and not-hunted snow leopards *Panthera uncia*. We also gained insight into how TEK is practiced. We later noted down these results in our field notebooks.

Additionally, we were invited to yearly gatherings of community-based conservancies in Tajikistan in November of 2017 and 2018. During these meetings, we were able to observe how community members from different conservancies come together to talk about important issues they face, share success stories, and make crucial collaborative decisions such as planning for the following year.

Data analysis
Data collection and analysis procedures were based on a grounded theory approach (Glaser and Strauss 1967, Corbin and Strauss 1990, Strauss and Corbin 1994:273) defined as "grounded in data systematically gathered and analyzed." Based on this approach, we carried out interviews with selected stakeholders, based on a preconfigured, explorative interview guideline, and analyzed these collected data. Subsequently, we adopted guidelines based on the insights we gathered from the first interviews to be addressed in the remaining ones. When we returned from the field, our data (interview notes) were transcribed into MAXQDA software (VERBI 2017). The data sets were first grouped into eras, for example, data before the Soviet occupation was one group. Then we carried out intensive coding whereby different codes were generated from the text and associated with different groups (i.e., under the group of "before Soviet occupation," the following codes emerged: "norms," "ethics," and "beliefs systems"). The second group, "Soviet Era," involved many codes such as "collectivization," "agriculture," "overhunting," and "loss of hunting knowledge." The third group was categorized as "Post-Soviet Era," and included codes such as "community-based conservation," "use of hunting knowledge," "hunter integration," "ownership," and "management." Then we started organizing and understanding specific aspects of hunters' knowledge that emerged from our analysis by pooling groups and categories together. The pooling of data provided an opportunity to assess how TEK persisted through social change. We focused on the following research questions: What kind of hunting knowledge existed before the Soviet Era? How was such knowledge transformed and affected by changes during the Soviet Era? How is such knowledge contributing to conservation in the context of community-based conservation? How do such arrangements shape social-ecological change in the communities?

RESULTS

Use of TEK and belief systems in the Pamir Mountains

Hunters of the past
For residents of the mountainous communities in the Pamir region of Tajikistan, hunting is one of the most fundamental, most important, and most ordinary practices that characterizes everyday life and enables survival. The concept of "hunters of the past" emerged from our analysis as a way that interviewees communicated specific ethics, taboos, and social norms associated with traditional practices that have been primarily brought to them/transferred through the hunters of the past. According to our interviewees, past hunters are regarded as the most successful because of their ecological knowledge and skills, i.e., the ability to get close to their prey. The concept emerged throughout the research and was used by local hunters. Within the concept of hunters of the past, often-mentioned figures were solo hunters (*duzy-shikar*) from different parts of the Pamir region who hunted game with the use of bows and later matchlock guns before and at the beginning of the Soviet era. Through our archival research, we found one passage that describes this idea of solo hunters from the region of Darvoz:

> *Regardless of the weather and the season, these hunters pierce the mountains for hundreds of miles, following the tracks of bears, leopards or sheep, which they never miss, firing only at close quarters... In case of failure, the mountaineer advances among the mountains, crossing deep snows, and sleeping in burrows or under rocks, for a week or more, as long as his provisions last.* (Johnston 1892:83).

Belief systems
The hunters of the past developed their specific hunting knowledge in connection with belief systems and moral ethics. Traditional hunters from the Pamir region identified hunting ethics and norms that they regarded as fair and that included a set of taboos. For example, shooting a young or a female ibex is viewed as unfair among the hunters because young ibex do not understand the danger humans pose to them. Also, four retired hunters from the Alichur village told us that ibex groups were stressed because of overhunting during the civil war. They mentioned that shooting an ibex group leader, i.e., an experienced male or female animal, would lead to animals abandoning their grazing areas. Hunters observed that during the civil war, ibex behaved typically, staying in large herds. Those hunters also mentioned that ibex avoided the Alichur village during the civil war. Now they claim that because of the stress of overhunting, ibex stay in small groups, have abandoned regular grazing grounds, and changed their habitat use. Hunters have reported that their beliefs and understanding of wildlife behavior encourages conservation of species while improving overall communities' resilience.

Reflecting on the spiritual relationship with the hunt, all of the 10 interviewed retired hunters and the 11 present-day hunters agreed that hunting has its joyful moments. When they are experiencing the joy of hunting they forget hunger, issues at home, and the freezing temperatures. They watch the animals and enjoy the spiritual connection to them. Those interviewed hunters argued that because hunters of the past were able to approach animals so closely, they could observe them better and see and enjoy this spiritual connection between them more intensely. They further elaborated that each herd of ibex has an angel or demon leading the group. Hunters described the concept of angel and demon with roots in Islamic ideas. When an angel leads the group,

then it is hard or even impossible to kill an animal because angel animals are smart and can sense humans quickly. When a demon leads the group, it is easier to hunt because a demon is not as sensitive and smart as an angel. Hunters value and enjoy such spiritual relationships with wildlife because for them, these relationships have conservation value.

Commonly, most community members believe and respect wildlife for their holiness. For instance, hunters always pray before shooting an ibex or Marco Polo sheep. There is a belief that because wild animals only consume fresh grass and clean water in the mountains they are considered as holy. The walls of most shrines in the Pamirs are decorated with ibex or Marco Polo sheep horns, which is meant to honor the sacredness of wildlife. Respondents described that in the past when hunting was not regulated, most of the hunters were asked to kill ibex or Marco Polo sheep in order to honor their passed relatives and to show respect to wildlife by donating the skulls and horns into the shrines (see Fig. 2).

Fig. 2. Wildlife skulls resting in Mazori Shohkambari Shrine in Langar village of Ishkashim region of Tajikistan.

Land and resource management systems

A set of hunting rules evolved known as the "100 and 1000 hunting rules" that are based on culture, ethics, and traditional norms of the villages but resonate with present-day conservation practices. These rules define the number of animals that hunters are allowed to hunt per trip and throughout their lifetime to prevent overhunting. That is, after 100 successful hunts, a hunter should organize a ceremony in the village and is not allowed to hunt for the next two seasons so that animal populations can recover. Hunters usually give up hunting for the rest of their lives after they kill a total of 1000 sheep and goats. From the traditional hunter's point of view, hunting 1000 ibex equals taking a human life. After having reached that number, hunters bury their gun, organize a ceremony for the village, and retire.

In a couple of villages (Sumchin and Yamchun), interviewees told us that a few hunters had reached the 1000 ibex limit. Many hunters stopped hunting even before reaching the 1000 animal limit because of other cultural norms. One hunter, for example, had killed 265 ibex in his career and stopped hunting after encountering a snow leopard in the mountains. According to him, seeing a snow leopard is a once-in-a-lifetime experience that carries deep meaning. He went on to explain that seeing the snow leopard was a signal to him that he should stop hunting and focus instead on teaching traditional hunting skills to a younger hunter. Of the 21 interviewed, 14 hunters confirmed that they knew hunting practices related to the "100 and 1000 hunting rules."

The same group of hunters told us that their people had developed norms that reinforced showing their respect for the animals, including not leaving them to die in pain. Hunters are ethically obliged to kill a wounded animal as quickly as possible. When searching for a wounded ibex, a hunter must spend the night in the mountains, thinking only about the wounded animal. If a wounded animal is left alone and in pain, the hunter will accumulate sins. The hunter has three days to find the prey. Within these three days, the hunter must leave the animal for predators if a predator has killed the wounded animal before the hunter could find it. Such hunting rules discourage recklessly shooting animals. Two of the 11 present-day hunters reported that they knew men who did not follow these rules and were later punished by Allah (Olloh) for not taking care of the ibex. These punishments took the form of misfortune that afflicted close family members.

Social institutions

Social institutions, such as the family and the community elders, have helped shape hunters' ethics and moral principles for hunting. The community played a vital role in shaping the hunters' ethics. Hunters of the past created rules and norms from their own experiences and those of their ancestors and predecessors. Community norms and ethics further deepened the hunters' understanding of moral values and influenced their perspectives on hunting. If a hunter, for instance, was repeatedly unsuccessful, it meant that he needed to change something in his life. A public ceremony was organized to encourage the hunter to find his luck again. Traditions of sharing and cleanliness are also upheld by communities. All hunters would usually share meat with other families because only a few men could obtain hunting skills, and therefore a village usually had only one or two hunters. When a hunter returns from the mountains after a successful hunt, for instance, the oldest person in the house greets him by sprinkling flour on top of the meat because white flour is associated with cleanliness and is used to accept fresh meat. Afterward, the hunter cuts the meat into smaller pieces and neighbors join for a meal. When neighbors leave, they are given pieces of meat to take with them.

World view of hunters

When hunters retire, they are expected to teach their skills to younger hunters in the village. All retired and active hunters we interviewed explained that they learned hunting skills from a family member, usually their father or grandfather. In most cases, the son of a hunter becomes a hunter too, if conditions allow it. Otherwise, a hunter picks an ambitious and intelligent young man in the village and trains him. The experienced hunter teaches the younger hunter all about the rules, norms, beliefs, and dangers of hunting. Retired hunters share their experiences through storytelling with the younger generation. Traditional hunting knowledge is thus culturally distilled knowledge, the sum of experiences of hunters reaching back centuries.

Of the 21 interviewed hunters, 18 told us that traditional hunting practices and transfer of knowledge declined during the Soviet Era. Three other hunters could not identify factors that decreased

traditional hunting knowledge. All of the 10 retired hunters knew more about traditional hunting practices and knowledge than the 11 modern-day hunters. Retired hunters identified several reasons for the decline in traditional hunting knowledge: First, the transition from a subsistence to a command economy brought subsidies to communities in the Pamir region (Herbers 2001) and, according to the hunters, the subsidies decreased the demand for wild game. Second, communities had easy access to guns during the Soviet Era (Conrad 2000) and, according to the hunters, such conditions offered people the opportunity to hunt without learning the traditional skills of hunting. Third, the hunting ban during the Soviet era did not allow younger hunters to practice hunting openly. The 1980s, USSR law on the utilization and protection of the animal world was introduced to protect wildlife in decline, but the law also inadvertently limited traditional hunting.

Role of TEK in conservancies today

During our interviews, all conservancy rangers, retired hunters, and present-day hunters confirmed that conservancies provide safe wildlife territories (especially from poaching for meat) for mountain goats and sheep. They also provide safe territories for their predators, such as the snow leopard. Most importantly, the hunters felt that their knowledge of the broader wildlife management in the conservancies was a valuable complement to scientific knowledge. Rangers of the conservancies told us that the conservancy approach helps them not only to implement wildlife management programs, but also to raise community awareness on ecological issues, e.g., discussing pasture use for livestock rather than leaving areas natural for wildlife habitat. Throughout our interviews, it was evident that from rangers' points of view, conservancies initially depended significantly on external support from scientific or NGO communities. Conservancies are now less dependent on external help after decades-long NGO intervention. They now have adequately trained staff to carry out wildlife management, and have achieved financial independence as a result of conservation hunts that they conduct to finance community development projects.

All 11 conservancy rangers told us that the management activities of conservancies enable communities to self-manage their resources efficiently. These management activities significantly depend on hunting profits. Such conservation work includes learning more about habitats and the distribution of mountain goats and sheep, the snow leopard population, and sustainable use of resources. Previously, most of the rangers, for example, did not know how to conduct scientific wildlife surveys because they had not done this before and thus never systematically recorded the age, sex, and numbers of wildlife. Through training, conservancy rangers are now capable of independently collecting raw data for scientific wildlife surveys. Also, the rangers agreed that each conservancy created conditions that encourage the younger generation of rangers to learn more about wildlife management from their peers outside of their community. Visits by different scientists and veterinarians to conservancies from abroad, for instance, give the younger generation opportunities to learn new skills from their peers, which they otherwise may not have access to. Although it is important to learn these new skills, it is also important to maintain respect for the knowledge base that local hunting communities already have.

Eleven conservancy rangers reported an increase in the wildlife population. One ranger from the Parcham conservancy, for example, told us that during the first two years (2009–2011) of wildlife observation, it was still difficult to see wildlife because of the aftermath of overhunting influenced by the Soviet-era development policies and civil war. He continued that only after four to five years, the wildlife population started to recover. Now, he explains, it is common to encounter wildlife near his home. Rangers from the conservancies believe that as a result of their measures to sustain wildlife populations (including year-round protection, alignment with community goals and local interests, and ongoing conservation efforts), the wildlife numbers are increasing. Conservancy rangers further elaborated on their observation that communities without local conservancies still face the problem of illegal hunting and poaching associated with the Soviet era. They regard this situation as a result of poverty and a high unemployment rate, both of which influence village hunters' choices to hunt illegally. Rangers had good knowledge of hunters from other villages without conservancies who hunt illegally

Four of the Parcham conservancy rangers clarified how hunter-specific ecological knowledge helps them to implement wildlife conservation in their conservancy. During our interviews, we learned that conservancy rangers possess ecological knowledge related to wildlife behavior, abundance and distribution, grazing habitats, seasonal movements, and reading the cues in the landscape because of their close and continued observation of the wildlife. Such skills were used, for example, to carry out annual wildlife surveys, a camera trap survey, and protect the wildlife from poachers. Conservancy rangers pointed out that it was relatively straightforward for them to learn the scientific wildlife monitoring techniques because they already possessed their own ecological knowledge of wildlife. During the interviews, conservancy rangers mentioned that traditional hunting rituals and spiritual beliefs support their conservation work. To name one example, "hunters of the past" followed stringent rules despite great hardships in hunting. The hunters of the past were valued because of their resilience to face hardship and because hunting rules established by previous generations guided their hunting practices. Conservancy rangers argued that, although they are not these hunters of the past, their ethical and moral principles that have been passed down for generations help them in leading their conservation work. In the territory of the conservancies, rangers no longer hunt like previous solo hunters did. Rather, they manage wildlife and assist trophy hunters from abroad. Most of the rangers used to be hunters and have hunted for many years, but they emphasized that they are managing and protecting wildlife in order to conduct sustainably managed hunts.

Rangers have gained an official role in conservancies unlike during the Soviet era, when all the wildlife was managed by the state. Traditional hunters did not play any role in this state-led system and their hunting was instead considered illegal. Now, rangers are managing their resources and retired hunters recommend knowledge and practices from the past because retired hunters see that younger rangers will apply such wisdom in their work.

Rangers from three different conservancies confirmed that they think that their success in wildlife management is based on their keen interest in having a sense of control over and managing their

resources, collaborating with their own local communities and international institutions, and the economic incentive they receive from regulated conservation hunting. Rangers in the conservancies also clarified that they received government support while the conservancies were created. As of today, conservancies have become much more independent, and support from the government institutions has eroded over time. Rangers have stressed that the government and its institutions need to recognize conservancies as necessary to successful wildlife management practice in Tajikistan. Rangers have further elaborated that such recognition would provide protection against external threats of land grabbing by elites or pressure from other hunting-related interest groups. As long as there is no formal support for their recognition, the conservancies will always be vulnerable to external threats.

Potential negative aspects of the conservancy approach on communities

Throughout our discussions, we also learned that the conservancies face difficulties. Two rangers from one conservancy, for instance, mentioned that their conservancy has not been as successful as others because of the mismanagement by the head of their conservancy. The leader had not provided clear guidance throughout the year and did not treat all the rangers equally, instead preferring to work with a few individuals close to him. More importantly, benefits gained from sustainable hunting stayed mostly with the leader and were not shared with the conservancy or among community members, as traditional customs would have demanded. This also shows that if not managed well by an adequately trained person, the conservancies approach can be used for self-interests of certain individuals with negative impact on community dynamics. In the case described above, the rangers, however, stayed positive. They cited the positive results of other conservancies and explained that they wanted to improve their work in the near future.

DISCUSSION

The aim of this study was to analyze existence and contribution of hunter-specific TEK to community-based conservation and how an integrative approach might improve social-ecological systems in the Pamir region of Tajikistan. Our results inform how integrating a conservancy approach with hunter knowledge could improve wildlife management systems and contribute to communities' overall resilience. All in all, our results contribute to scholarly literature on traditional ecological knowledge and hunting, which is a key part of the TEK toolkit that allows people in the Pamirs to make the most of community-based conservation.

Role of conservancies in strengthening the social-ecological systems

Conservancy approach to sustain hunters' TEK

Our findings on hunters' observations and knowledge of wildlife behavior and ecology from the Pamir region are consistent with results of Berkes (2012), Parlee et al. (2005), and Padilla and Kofinas (2014) from the North American Arctic regions. For instance, Parlee et al. (2005) argue that hunters can gather information on caribou density and population health by observing wildlife movements and fall migratory paths. Our findings also support the work of Huntington and Watson (2012), who attest that groups' belief systems help them to control and to regulate herds. These similarities between the hunting communities from the Pamir region and the North American Arctic region suggests that there are generalizable beliefs that transcend regions that were established to conserve wildlife populations. For example, in Alaska and northern Canada, it is very important not to shoot the lead caribou (Padilla and Kofinas 2014) because this can completely disrupt the migratory pathways and distribution of the caribou for the remainder of the year. Caribou may thus become less available for harvest by the community. Storytelling is another common form of knowledge sharing in many traditional hunting communities. This is by far the main way that knowledge is transferred through generations, and stories about hunting usually provide ethical lessons in addition to important knowledge of animal behavior.

Despite modernization and mechanization, TEK continues to play an important role in conservation. Our finding on the existence of hunter-related TEK in the Pamir Mountains is complementary to findings of Gómez-Baggethun and Reyes-García (2013) that some TEK can be resilient to modernization. Although they documented the loss of much TEK in Spain as due to societies' market integrations, conservation policies, and acculturation (Gómez-Baggethun and Reyes-García 2013), other researchers have claimed that TEK systems can adapt to external and internal changes over time (Berkes et al. 2000). For example, indigenous communities in Arctic Alaska have replaced their traditional use of dog teams for transportation with snowmobiles but have maintained other fundamental components of their traditional harvest system (Brinkman et al. 2014). We should note that, similar to the study by Crate (2006), we found that socialization and schooling have contributed to community disengagement and devaluation of elders' knowledge in the Pamir region of Tajikistan.

The small group of hunters of the Pamir region is one of the exceptional cases where TEK has remained in use despite socioeconomic, environmental, and political changes that include a devastating civil war. Berkes et al. (2000) and Folke (2004) have pointed out that TEK systems can make the social-ecological system more resilient to changes. It is well documented that TEK systems' resilience and existence primarily depends on its use (Kassam 2010, Gómez-Baggethun and Reyes-García 2013, Oteros-Rozas et al. 2013). Based on our findings we have learned that hunters' TEK in particular survived well through the socioeconomic and environmental changes of the Soviet era. Not all types of TEK have survived, however; for instance, Kassam (2009) found that in the same period of time some of the communities, i.e., Savnob and Basid villages in the Bartang Valley, lost their TEK specific to agriculture. Because hunters continued hunting (clandestinely), their TEK survived. Agro-pastoral groups, on the contrary, were more affected by the collectivization and mechanization of agriculture in the Pamir region (Kassam 2009). Hunting, however, was a largely invisible activity in remote mountain areas, thus making it possible for traditional hunters to continue their practices. Now, hunters enjoy high esteem within Pamir mountain communities and TEK associated with hunting is regarded as valuable knowledge.

Improved strategies and coping mechanisms

Ruiz-Mallén and Corbera (2013) found that comanaged conservancies and their cross-institutional collaboration provide them with better methodical planning and decision making to

deal with change, which contributes to the conservancy's overall social-ecological resilience. From our study, we have learned that in addition to cross-institutional collaborations, conservancies also benefit from inter-regional collaboration, i.e., all conservancies from different regions of Tajikistan have united under the umbrella organization ANCOT. If one conservancy is confronted with issues of corruption (Brockington 2004) or elite grabbing (Kamoto et al. 2013), for example, inter-regional collaboration allows different conservancies to meet and to discuss the matters at stake and to jointly decide on how to approach the respective challenge. We define elite grabbing as when people with political influence pressure local businesses in order to change their approaches, or when they take over local businesses without the consent of the owners. On the one hand, this process brings more people together who can generate more comprehensive and elaborate responses to address an issue. On the other hand, issues discussed may alert other conservancies of problems they might face in the future. The creation of ANCOT was partly a response by the conservancies to external pressure and threats. Realizing their vulnerabilities, different conservancies have grouped to create stronger resistance to overcome external pressure and threats. Such an alliance adds to the conservancies' social-ecological resilience.

Improved wildlife management

As shown above, the conservancies approach empowered and incentivized hunters to take responsibility for wildlife management. In Tajikistan, protected areas, national parks, and the committee for forest management do not have the resources to carry out adequate wildlife management because of limited funding and weak state institutions (Brue et al. 2003, Michel et al. 2015). Poaching and habitat degradation by livestock is still a key threat to, namely, species of markhor (*Capra falconeri*), Marco Polo sheep, and urial (*Ovis orientalis*; Michel 2008, Michel et al. 2015, Michel and Karimov 2017). In the absence of state management programs, community-based conservancies are providing antipoaching and management services. Rangers of the community-based conservancies are highly motivated to protect wildlife not only because of incentivized conservation programs but also because their work gives them a sense of control over their natural resources, similar to findings of Ruiz-Mallén et al. (2015) from Latin America.

Providing equal job opportunities for community members

Conservancies have been shown to reduce gender discrimination by employing both men and women in remote regions of Tajikistan where unemployment is high. Until very recently, gender roles in the communities were strict: for example, men provided guiding services for hunters and women cooked. In recent years, however, female hunters (mostly from western countries) and travelers to the region have begun requesting female hunting guides, a likely effect of the increasing number of female hunters around the world (Keogh George 2016). Since 2017, two conservancies have been training female guides to provide tourism and hunting guiding services. This example of transformation and adaptation in conservancies aligns well with the argument of Berkes and Turner (2006) that people's ability for self-organization and their capacity to learn and adapt to new circumstances is a fundamental part of their social-ecological resilience.

Potential negative impacts of development projects in the region

Both positive and negative consequences of community-based conservation approaches and integration of TEK into conservation have been widely debated by scholars around the world. We do acknowledge that if not planned and implemented, such approaches can erode trust and cause conflict among communities, e.g., when only a few individuals benefit from the community-based conservation approach. Similar occurrences have been documented: Belsky (1999) noted that the implementation of an ecotourism program via a community-based conservation approach in Belize resulted in community conflicts and privatization of tourism businesses, which only benefitted a few households. Similarly, Nadasdy (2005, 2012) argued that integration of TEK can have political uses. We have to acknowledge that in our case, not all the rangers, hunters, and community members are environmentalists. Conservancies' approaches have been successful in certain communities and may not be successful in others because of socio-political differences. Unless ideas and interests come from the community itself, it is difficult to sustain such projects in the region regardless of whether they focus on tourism, hunting, or handicrafts. Before such projects are introduced, participatory approaches (Etienne et al. 2011) should be used to identify issues communities are facing. Communities should create solutions and enabling conditions to establish ownership and responsibility of the implementation of the project.

RESEARCH AND MANAGEMENT IMPLICATIONS

We found that there exists a rich body of knowledge, beliefs, and cultural practices among the hunters in the Pamir region of Tajikistan. A significant portion of this hunter-specific knowledge has been kept alive through socioeconomic and environmental changes. Merging hunter knowledge with conservancy approaches has enabled hunters to reach out to broader collaborations. Hunters were, for example, better positioned to collaborate within their own communities and with scientists from abroad. Thus, they could implement more effective wildlife management strategies, which in turn contributed to an overall improved community development. Our results reflect that holding TEK as equally relevant to outside knowledge helps conservancies succeed by merging hunting practices and knowledge with conservancy practices.

We also learned that conservancies receive significant international support but rarely from government institutions. Nonetheless, strong government support is required to provide enabling conditions for conservancies to carry out wildlife management and protect wildlife from external threats such as corruption and elite grabbing. We call for future research to look into practices of comanagement approaches and scenarios and to explore new ways of collaboration and power-sharing among the conservancies, government agencies, and other stakeholders specifically in the field of wildlife management. Such collaborations could lead to the availability of more transparent knowledge and resource sharing, which in return allows the implementation of sustainable wildlife management practices while improving the overall social-ecological resilience of communities.

Responses to this article can be read online at:
http://www.ecologyandsociety.org/issues/responses.php/11253

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Appendix 1

Phases of political change in Tajikistan and related transformations of hunting practices. (Sources: Govrilyuk and Yaroshenko 1987, Fedosenko and Blank 2005, Massell 1968, Wolfe and Weiner 1982)

Government structure in Tajikistan	*Years*	*Laws and significant events that affected hunter societies*
Emirate of Bukhara	1918-1920	Soviet Military re-conquest of Central Asia. Subsistence hunting using bows, traps, and matchlock guns was common.
Soviet Era: Tajik SSR	1920-1991	1959: measures to regulate hunting practices were adopted throughout the USSR. All hunting activities should be tied to game management areas managed by the government, cooperatives and public organizations. Based on this law, hunters must be members of a hunting association, have to pass a hunters' exam and pay government taxes, have to own a hunting license and be a USSR citizen (Baskin 2016). Establishment of this law supported the creation of private hunting concession in Tajikistan. 1980: the law of the USSR on the utilization and protection of the animal world was introduced. 1984: legislation was revised and strengthened with additional amendments to foster improved protection for wildlife.
		1978: the "Red Book" of the USSR was released, intending to reverse wildlife decline. The red book listed species in decline or close to extinction and meant to be preserved (Wolfe and Weiner 1982). The species of the Red Book have been strictly protected and hunting was officially not allowed. In reality, however, hunting continued unofficially. 1988: The Tajik SSR Red Book in 1988 was modeled after the USSR Red Book
Tajikistan independence	1991-present	1992-1997: Civil War: extensive illegal hunting took place in the Pamir region of Tajikistan.
	1989-present	5 private hunting concessions, which are run as private businesses and in some cases by outsiders and not community representatives, were established.
	2008-Present	Community-based conservation: The number of mountain ungulates (Marco Polo sheep *Ovis Ammon Polii*, markhor *Capra Falconeri*, ibex *Capra sibirica* and urial *Ovis orientalis vignei*) are growing again (Michel 2008).